

REMARKS

Preliminarily, Applicants respectfully request the Examiner to return initialed form PTO/SB/08A&B (modified) for the Information Disclosure Statement filed March 30, 2004. A copy of Form PTO/SB/08A&B (modified) is attached hereto for the Examiner's convenience.

The Title of the Invention has been amended as suggested by the Examiner.

Claim 1 has been amended to incorporate therein the recitation of claim 2. Claim 2 has been canceled.

Review and reconsideration on the merits are requested.

Claims 1 and 4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art in view of U.S. Patent 4,358,663 to Sperner et al.

Sperner et al was cited as teaching a heater plug including a heater coil made of a high-temperature-melting metal covered with a cladding or jacket of a metal from the platinum group or of an alloy comprising at least one metal from the platinum group (column 3, lines 25-29). The reason for rejection was that it would have been obvious to provide a heater coil with a platinum coating as taught by Sperner et al in place of the uncoated heater wire of the admitted prior art (i.e., Applicants' Fig. 2) in order to increase the stability of the heater wire at elevated temperatures and thereby prolong heater life.

Claim 2 was rejected under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art in view of Sperner et al, further in view of U.S. Patent 4,582,980 to Izzi. Izzi was cited as teaching a glow plug having a heating coil made of a Fe-Cr-Al alloy, citing column 3, lines 28-

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35. The reason for rejection was that it would have been obvious to use the Fe-Cr-Al alloy of Izzi in the heater coil (of the combination of admitted prior art and Sperner et al) to provide rapid heat-up and improved heating control.

Claim 3 was rejected under 35 U.S.C. § 103(a) as being unpatentable over admitted prior art in view of Sperner et al, further in view of JP 2001-153359. JP '359 was cited as teaching a Pt coating layer of a heating coil of a glow plug having a thickness of from 0.5 to 10 μm . The reason for rejection was that it would have been obvious to coat the wire core of the glow plug (the combination of admitted prior art and Sperner et al) within the claimed thickness range to prevent peeling or oxidation, yet minimize the amount of platinum needed and thus reducing cost.

Applicants traverse, and respectfully request the Examiner to reconsider in view of the amendment to the claims and the following remarks.

The present invention is directed to a glow plug including a sheathed heater including a heating coil portion and an insulating MgO powder charged in the sheath. The heating coil portion comprises a coil base material and a coating layer. The coil base material comprises a Fe-Cr-Al alloy, and the coating layer is selected from a metal or metal alloy of Pt, Pd, Rh and an alloy of two or more of Pt, Pd and Rh. The present invention solves the problem of the reaction of the insulating MgO powder with Fe or Ni contained in an alloy used to form the heating coil portion. This is achieved by coating the coil base material with a noble metal or alloy thereof as claimed in claim 1, to prevent direct contact between the MgO and the coil base material.

Particularly, the present invention provides a glow plug that exhibits practically sufficient durability even at a high temperature in excess of 1,000°C. See paragraph [11].

Turning to the cited prior art, Sperner does not disclose a Fe-Cr-Al alloy core, or an insulating powder embedding the coil. That is, in Sperner et al, heater coil 6 is wound around supporting body 5, but is not embedded in an insulating powder within protected tube 3.

Izzi discloses a Fe-Cr-Al alloy core and a MgO powder embedding the coil. However, the Fe-Cr-Al alloy is covered by Ni. The Ni conductive coating 9 on initial length L1 of spiral 7 is not a heating element, but rather is a control resistance element for the supply current upon an increase in the sheath temperature. See Abstract and col. 3, lines 14-35.

More particularly, the Ni coating on the Fe-Cr-Al alloy of Izzi is essential, because this specific combination of materials having opposing characteristics enables it to work as a control resistance element. The pertinent portion of Izzi at col. 3, lines 28-35 is reproduced as follows:

Said filament 8 comprises an alloy of Fe-Cr-Al while the conductive coating comprises nickel (Ni). The selection of these materials is in connection with the characteristics thereof as required in the specific use for glow plugs. The alloy Fe-Cr-Al has a high electric resistance and low temperature coefficient, while nickel has opposite characteristics, that is a low electric resistivity and high temperature coefficient.

With respect to the rejection of claim 2, the Examiner considered that it would have been an obvious expedient to use the Fe-Cr-Al alloy of Izzi in the heater coil of Sperner et al. However, the Ni coating is an integral part of the control resistance element of Izzi, such that one of ordinary skill would not consider simply substituting the core material without also including the Ni coating. For the same reason, it is respectfully submitted that the suggested combination

is improper because the Ni coating in Izzi cannot be replaced by the Pt coating in Sperner et al without also destroying the intended function in Izzi as a control resistance element.

From a different perspective, Izzi, while employing a core alloy of Fe-Cr-Al, did not recognize the problem of reaction with the insulating MgO powder, whereas Sperner et al does not employ such powder and therefore would not have considered protecting a core Fe-Cr-Al alloy of Izzi in the first instance.

JP '359 discloses a Pt coating for a control coil made of carbon steel wire, but not for a heating coil made of Fe-Cr-Al alloy.

In summary, each of Sperner et al, Izzi and JP '359 fails to disclose even any kind of coating for a heating coil made of a Fe-Cr-Al alloy. For the same reason, there is no basis in the prior art to adapt a coating made of Pt, Pd or Rh to a heating coil made of Fe-Cr-Al alloy, in the absence of the specific teachings in Applicants' specification.

For the above reasons, it is respectfully submitted that the amended claims are patentable over each of admitted prior art, Sperner et al, Izzi and JP '359, considered alone or in combination thereof, and withdrawal of the foregoing rejection is respectfully requested.

Withdrawal of all rejections and allowance of claims 1, 3 and 4 is earnestly solicited.

In the event that the Examiner believes that it may be helpful to advance the prosecution of this application, the Examiner is invited to contact the undersigned at the local Washington, D.C. telephone number indicated below.

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Respectfully submitted,



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